

7. (Amended) A stiff, metallic hub as recited in claim 2, wherein the design operating speed of the flywheel assembly is about 22,500 revolutions per minute.

REMARKS

Claims 1 through 13 are pending in the subject application. Claims 1-4, 6, and 12 stand rejected under 35 U.S.C. 102(b). Further, claims 5, 7-11, and 13 stand rejected under 35 U.S.C. 103(a). Claim 6 stands rejected under 35 U.S.C. 112, second paragraph, which claim is amended by this amendment. Claims 2, 3, 5, and 7 have also been amended. Claim 1 has been canceled.

The Applicant appreciates the Examiner's thorough examination of the subject application and respectfully requests reconsideration of the subject application based on the foregoing amendment and the following remarks.

35 U.S.C. 112, SECOND PARAGRAPH REJECTION

The Examiner rejected claim 6 under 35 USC 112, second paragraph as being indefinite. The Applicant has amended the claim and placed it in a condition for allowance. Early and favorable action is requested.

35 U.S.C. § 102(b) REJECTION

The Examiner rejected claims 1-4, 6, and 12 under 35 USC 102(b) as being unpatentable over U.S. Patent No. 5,962,941 to Serdar, et al. The Applicant respectfully traverses these rejections for reasons detailed below.

The patent to Serdar ("Serdar" or the "Serdar Reference") discloses an energy storage apparatus 500 including a hub 580 rotatably positioned about an axial shaft, the hub 580 having at least one spoke plane 582 projecting radially from the hub 580 and at least one spoke 584 per spoke plane 582. See, e.g., Serdar, column 5, lines 46-

64. Moreover, the end of each spoke 584 is slidingly engaged to the rotor 510 at the rotor to hub interface 590. See, Id., col. 6, lines 16-27; FIGs. 7 and 8. Accordingly, the Applicant respectfully asserts that Serdar reference expressly teaches away from the hub of the invention as claimed.

By comparison, the invention as claimed provides a flywheel hub 40 that minimizes loss of interference fit between the hub 40 and the composite rim 20 of the flywheel at very high rotational speeds and, further, minimizes vibrations that can result from the loss of interference fit. See, e.g., Application, page 5, lines 17-20. The outer rim 90 of the hub 40 reduces vibrations by maintaining a tight interference fit with the composite rim 20. Id., p. 12, line 32 to p. 13, line 2. In short, the hub of the Serdar reference is a "slip fit" type hub that accommodates higher speeds by sliding, whereas the invention as claimed accommodates higher speeds by elastic growth, i.e., bending.

Additionally, there are several problems with "slip fit" hubs. First, manufacture of spoke 584 and socket 594 requires precise tolerances of both elements, which, if achievable at all, would be very expensive. Thus, the relationship between the spoke 584 and socket 594 likely will be either too loose or too tight. If the tolerance is such that the spoke 584 and socket 594 are too loose, an imbalance can occur and/or the hub can move in a haphazard, substantially radial direction, which can affect the performance of the flywheel substantially and/or damage the flywheel. If, on the other hand, the tolerance is too tight, then the Serdar hub will not slidingly engage the rotor as it is designed to do.

The Serdar hub also cannot arrest relative vibratory motion between the rotor and the rim, whereas the invention as claimed can. Finally, the Serdar system does not lend itself to finite element analysis, which makes design infinitely more difficult.

Therefore, it is respectfully submitted that, for the foregoing reasons, independent claim 2 (as amended) and all dependent claims thereof are not made obvious by the Serdar reference and, further, satisfy the requirements of 35 U.S.C.

100, et seq. As such, the Applicant believes that claims 2-4, 6, and 11 are allowable. Moreover, it is respectfully submitted that the subject application is in a condition for allowance. Early and favorable action is requested.

35 U.S.C. § 103(a) REJECTION

The Examiner rejected claims 5 and 7-11 under 35 USC 103(a) as being unpatentable over Serdar. Furthermore, The Examiner rejected claim 13 under 35 USC 103(a) as being unpatentable over Serdar in light of U.S. Patent No. 5,634,381 to Thoolen. The Applicant respectfully traverses these rejections for the same reasons presented above in our discussion of the grounds for the §102(b) rejection. Indeed, the Serdar reference neither anticipates nor makes obvious the invention as claimed.

It is respectfully submitted that, for the foregoing reasons, the claims are not made obvious by the Serdar reference and/or the Thoolen reference and, further, satisfy the requirements of 35 U.S.C. 100, et seq. As such, the Applicant believes that claims 5, 7-11, and 13 are allowable. Moreover, it is respectfully submitted that the subject application is in a condition for allowance. Early and favorable action is requested.

The Applicant believes that no additional fee is required for consideration of the within Response. However, if for any reason the fee paid is inadequate or credit is owed for any excess fee paid, you are hereby authorized and requested to charge Deposit Account No. **04-1105**.

Respectfully submitted,

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**ANNEX TO RESPONSE TO OFFICE ACTION
CONTAINING MARKED-UP VERSIONS OF AMENDED CLAIMS**

Please amend the claims as follows:

2. (Amended) A stiff, metallic hub for an energy storage device, having a flywheel assembly, wherein the hub produces a critical velocity that exceeds the design operating speed of the flywheel assembly, the~~A stiff, metallic hub as recited in claim 1,~~ comprising:
 - a central core in tight interference fit with a rotary shaft of the flywheel assembly;
 - an outer rim section in tight interference fit with a high-strength, low-density composite fiber rim of the flywheel assembly; and
 - a web section.
3. (Amended) A stiff, metallic hub as recited in claim 2~~1~~, wherein the hub is manufactured of material selected from the group comprising aluminum, titanium, and steel.
5. (Amended) A stiff, metallic hub as recited in claim 2~~1~~, wherein the critical velocity is between about 1.4 and about 3.0 times the design operating speed of the flywheel assembly.
6. (Amended) A stiff, metallic hub as recited in claim 2, wherein at high operating speeds, the outer rim section is capable of~~remains flexible enough to deforming~~ in a radial direction commensurate with radial deformation of the composite fiber rim of the flywheel assembly to maintain a tight interference fit to substantially minimize vibrations.
7. (Amended) A stiff, metallic hub as recited in claim 2~~1~~, wherein the design operating speed of the flywheel assembly is about 22,500 revolutions per minute.